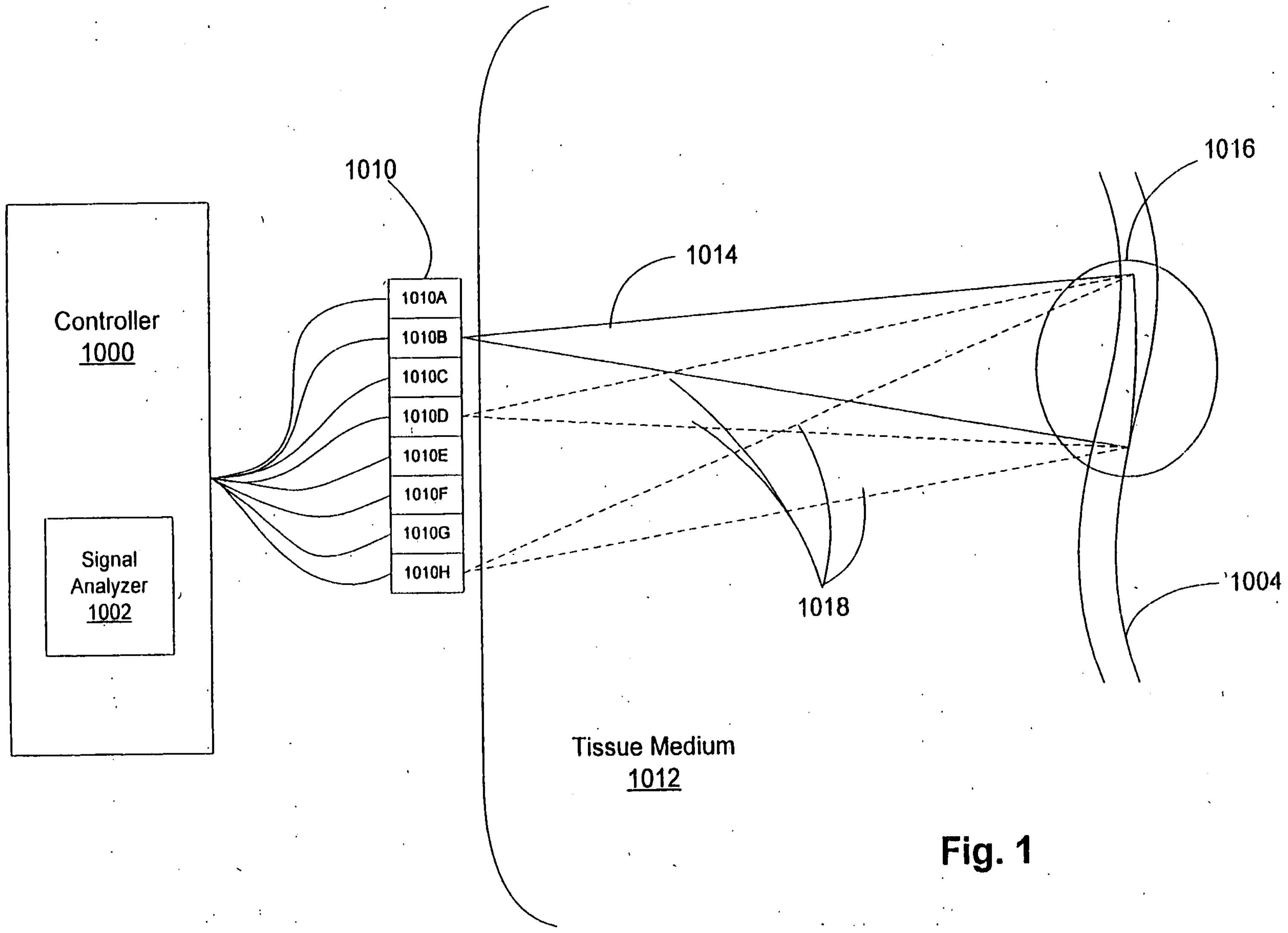
Controller
Signal
Analyzer
1010F
1010G
1010H
Tissue Medium

Fig. 1

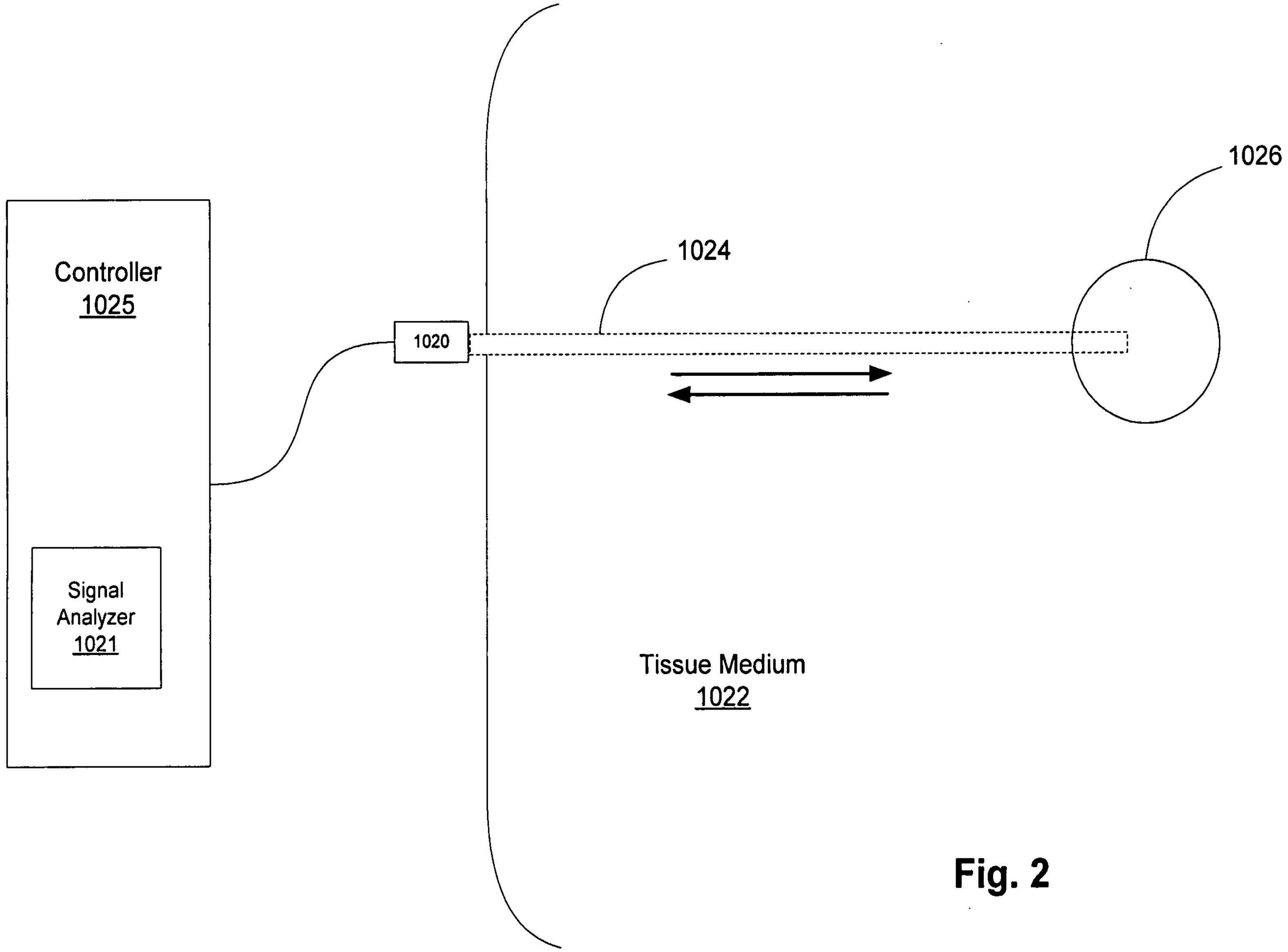
Controller
Signal
Analyzer
Tissue Medium

Fig. 2

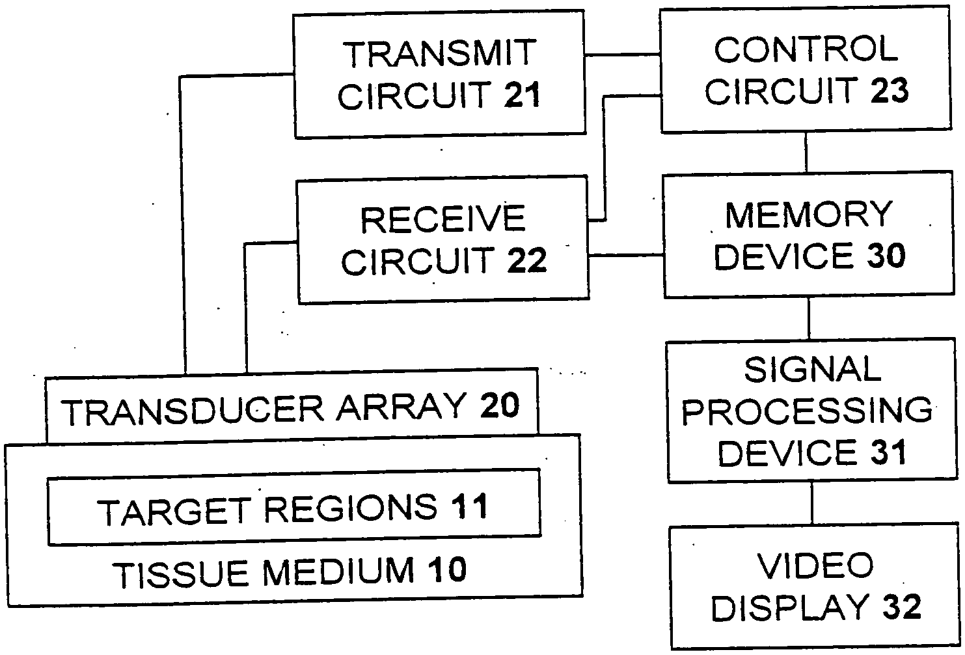
TRANSMIT CIRCUIT 21
CONTROL CIRCUIT 23
RECEIVE CIRCUIT 22
MEMORY DEVICE 30
SIGNAL PROCESSING DEVICE 31
TRANSDUCER ARRAY 20
TARGET REGIONS 11
TISSUE MEDIUM 10
VIDEO DISPLAY 32

FIG. 3

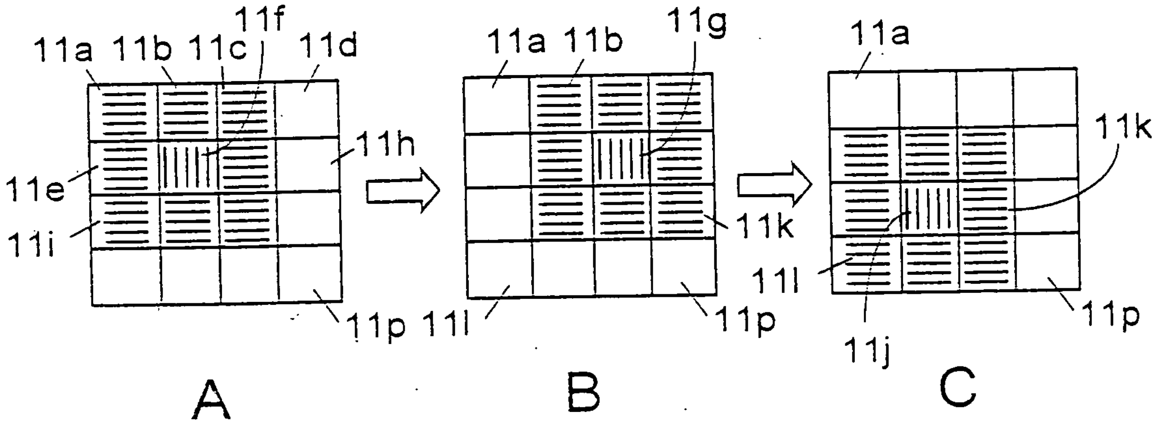
11a
11b
11c
11f
11d
11h
11e
11i
11p
11l
A
11a
11b
11g
11k
11l
11p
B
11a
11k
11l
11j
11p
C

FIG. 4

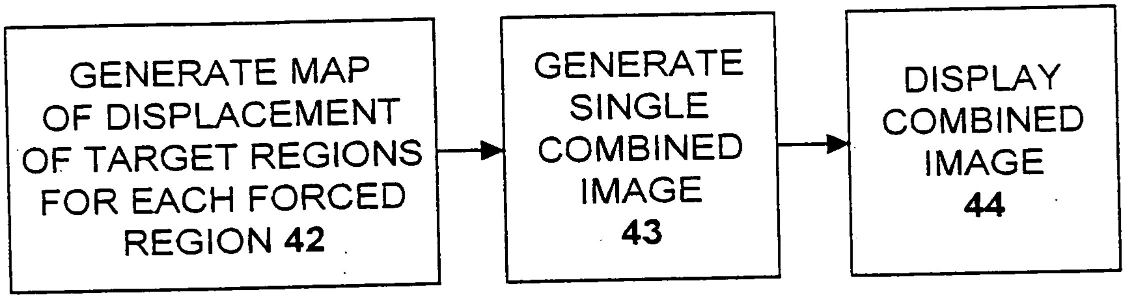
GENERATE MAP OF DISPLACEMENT OF TARGET REGIONS FOR EACH FORCED REGION 42
GENERATE SINGLE COMBINED IMAGE 43
DISPLAY COMBINED IMAGE 44

FIG. 5

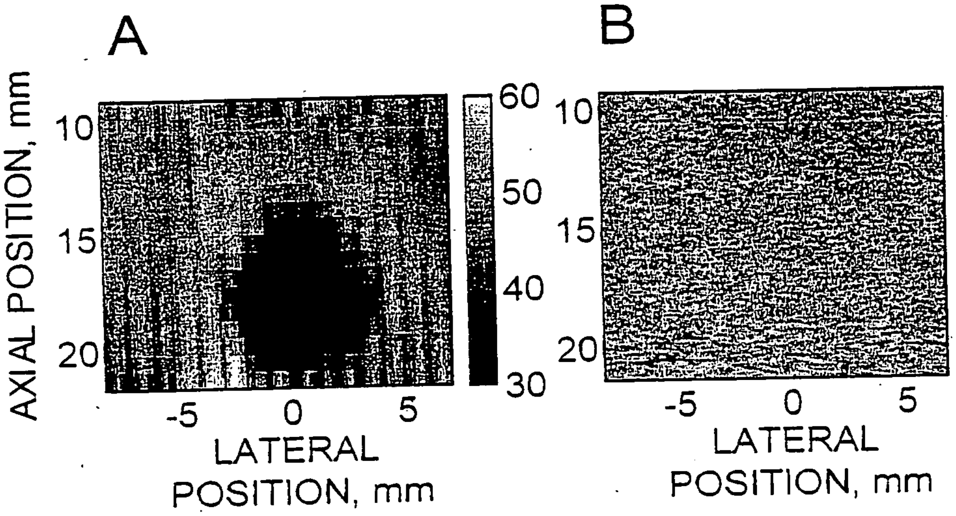
A
B
AXIAL POSITION, mm
10
15
20
-5
0
5
LATERAL POSITION, mm
60
50
40
30
10
15
20
-5
0
5
LATERAL POSITION, mm

FIG. 6

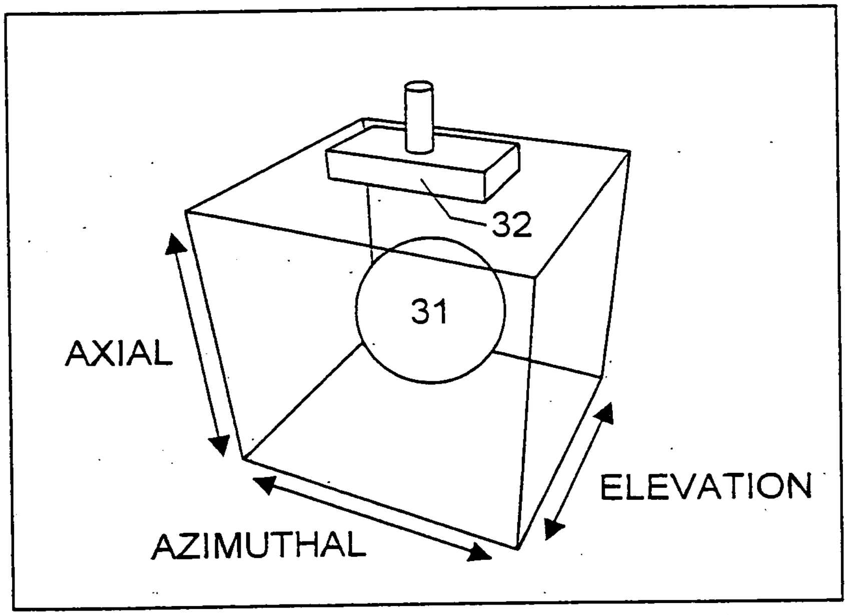

FIG. 7

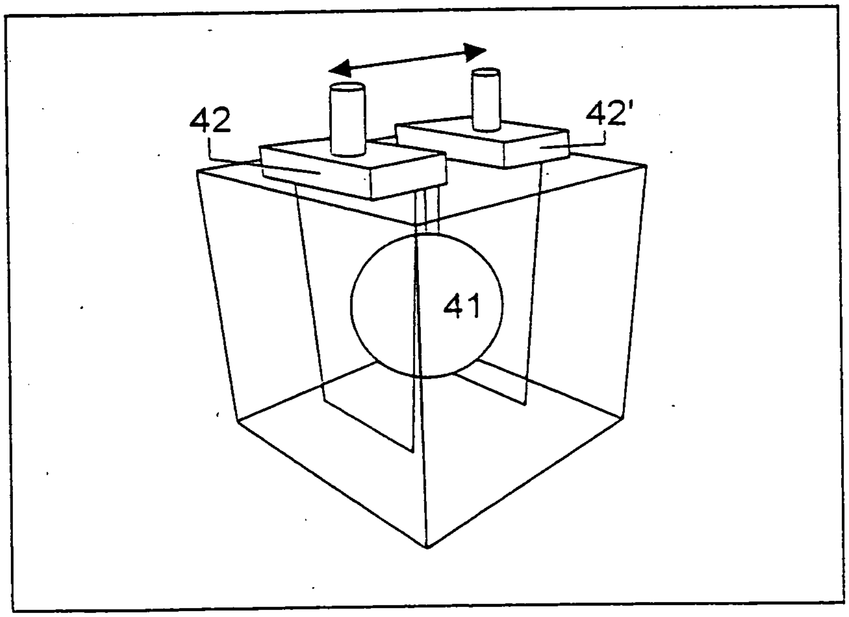

FIG. 8

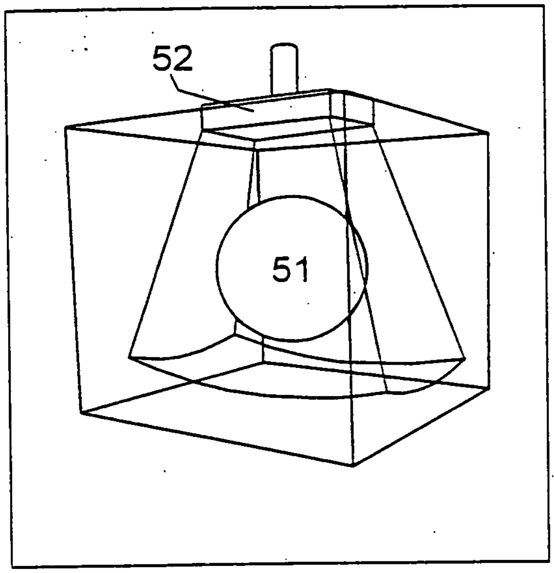

FIG. 9

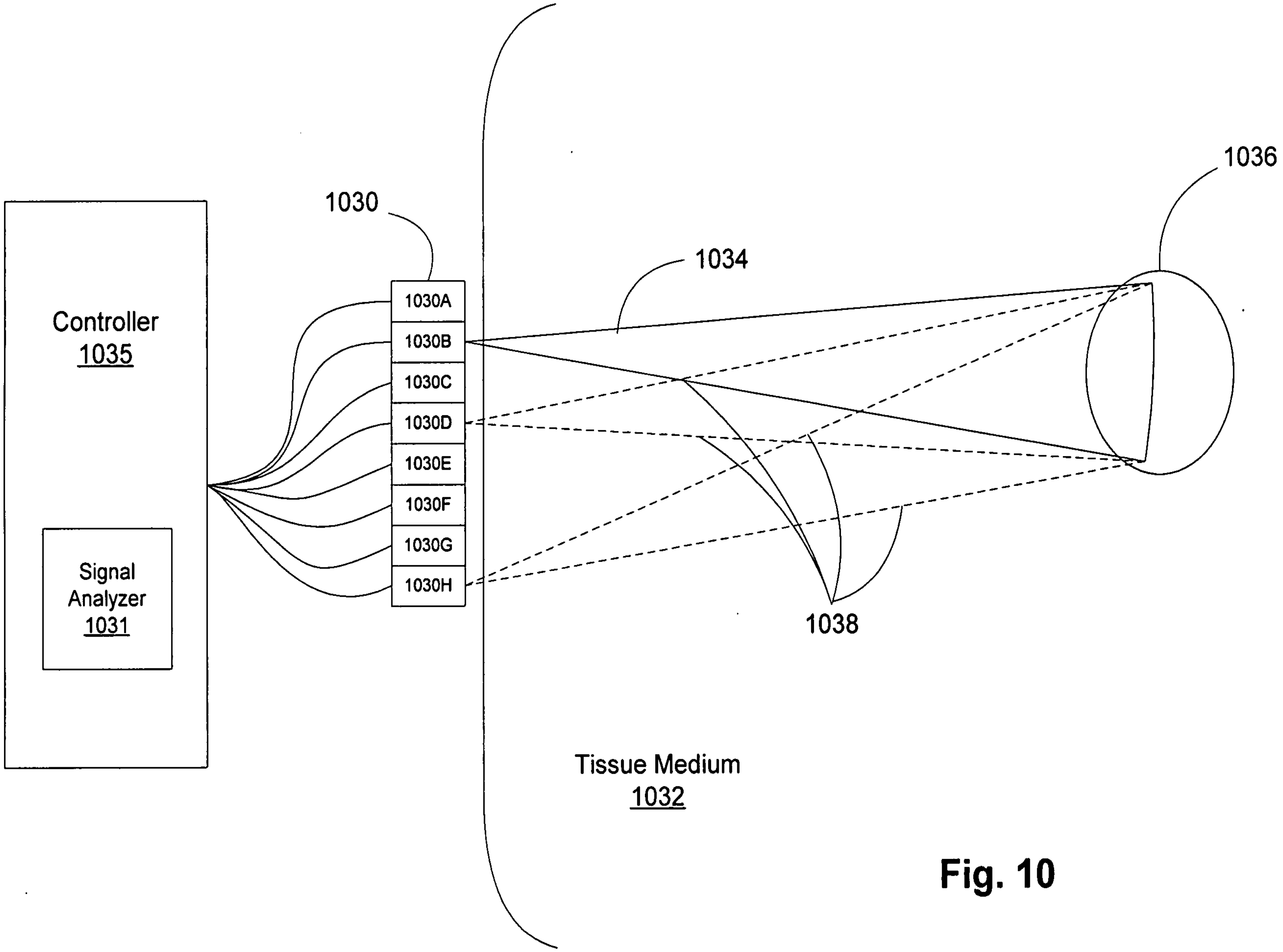
Controller
1030F
1030G
1030H
Signal
Analyzer
Tissue Medium

Fig. 10

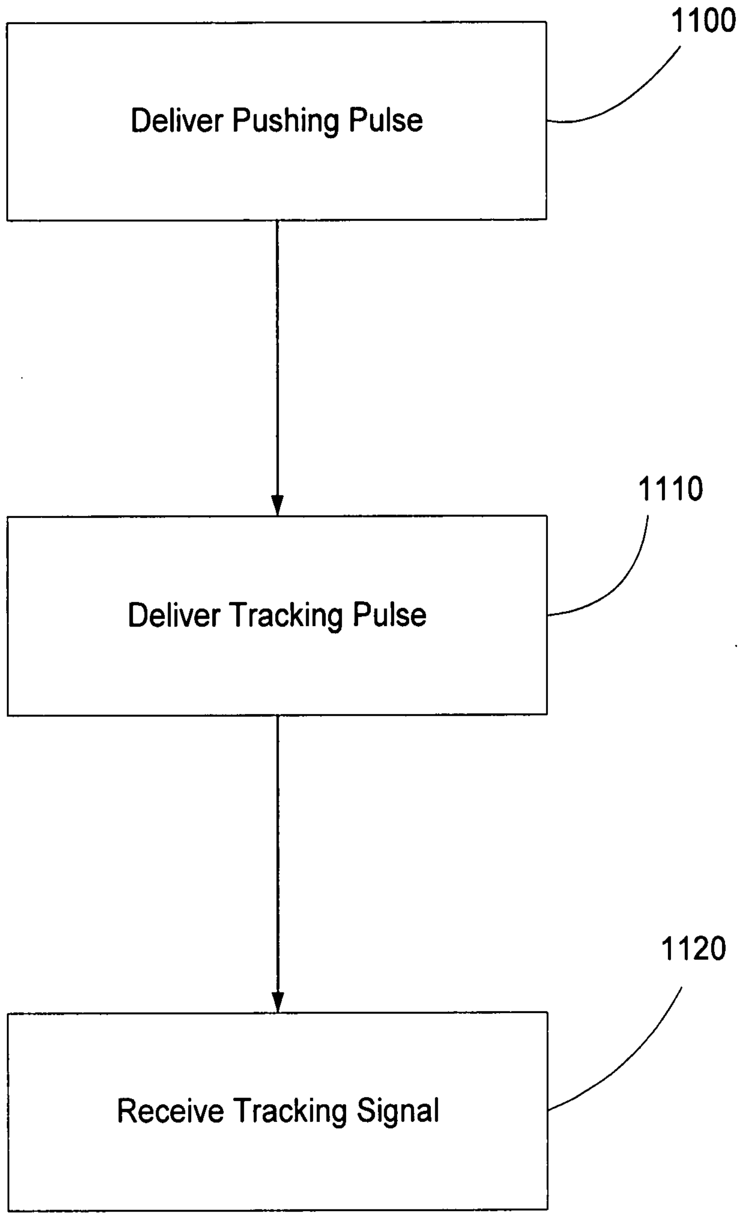
1100
Deliver Pushing Pulse
1110
Deliver Tracking Pulse
1120
Receive Tracking Signal

Fig. 11

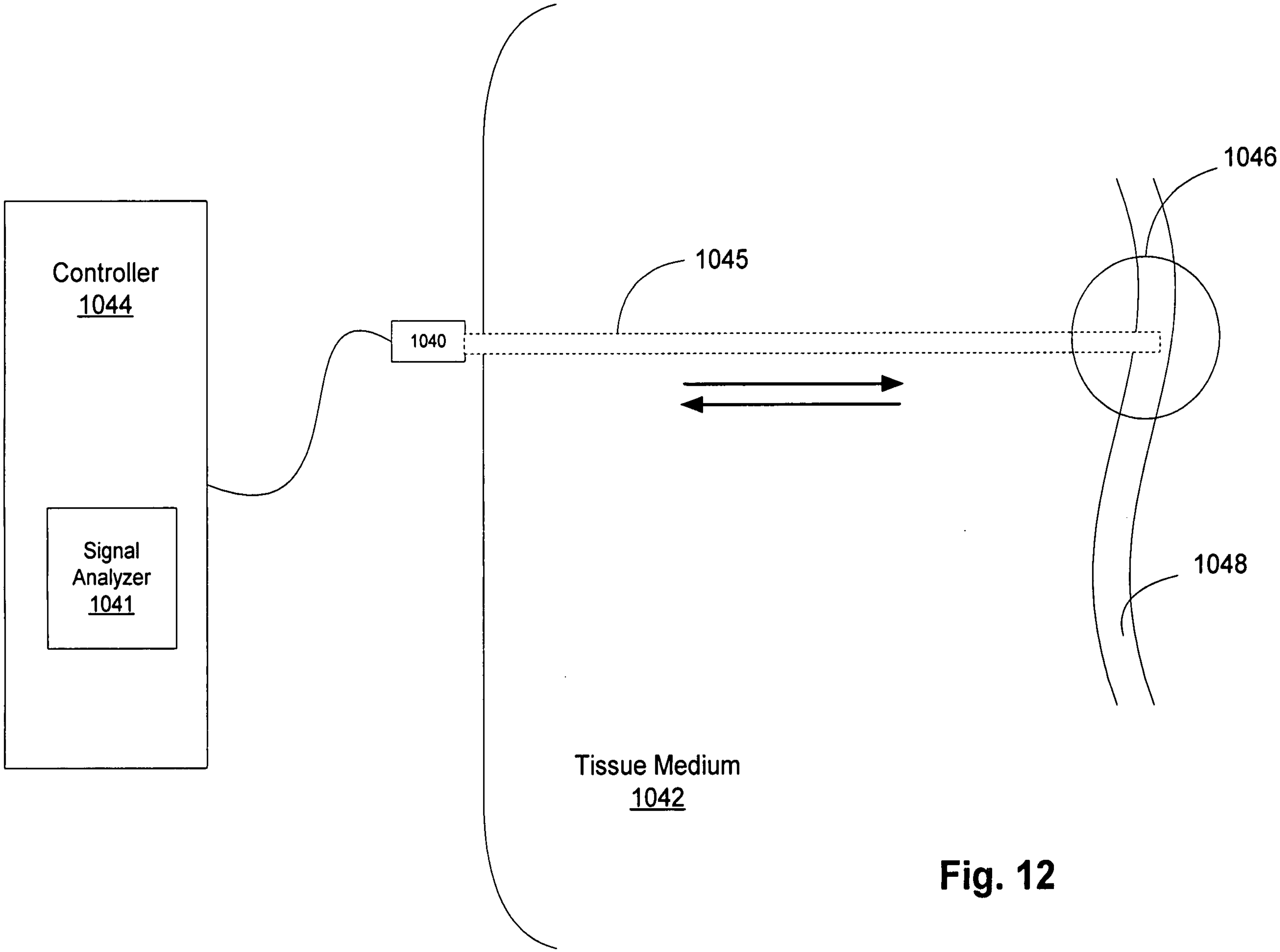
Controller
Signal
Analyzer
Tissue Medium

Fig. 12

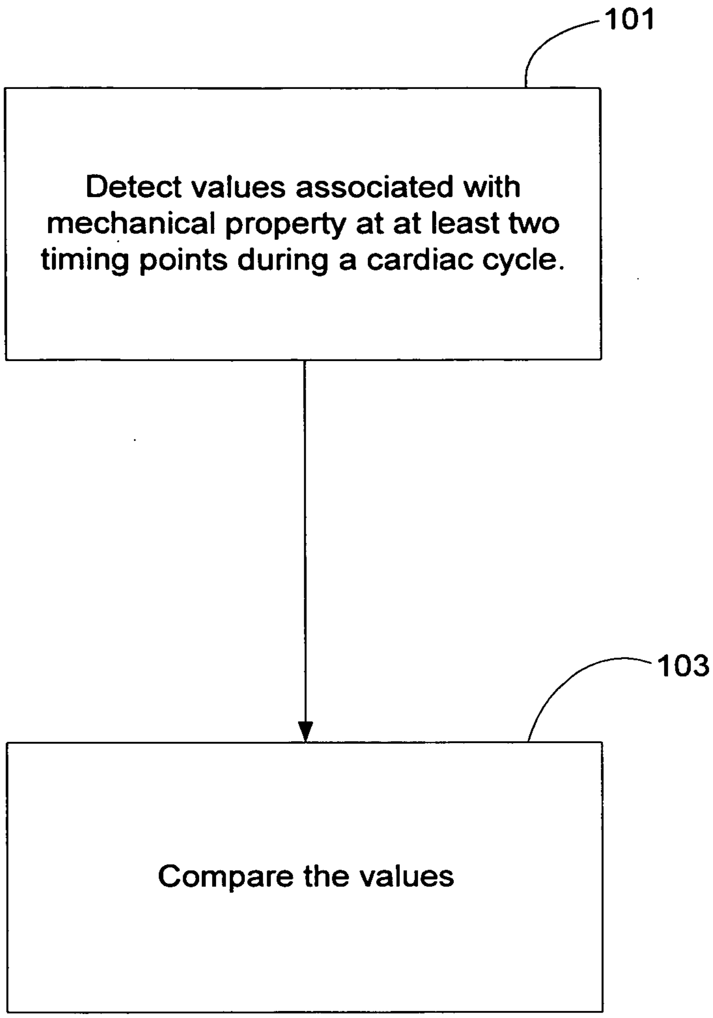
101
Detect values associated with mechanical property at at least two timing points during a cardiac cycle.
103
Compare the values

FIG. 13

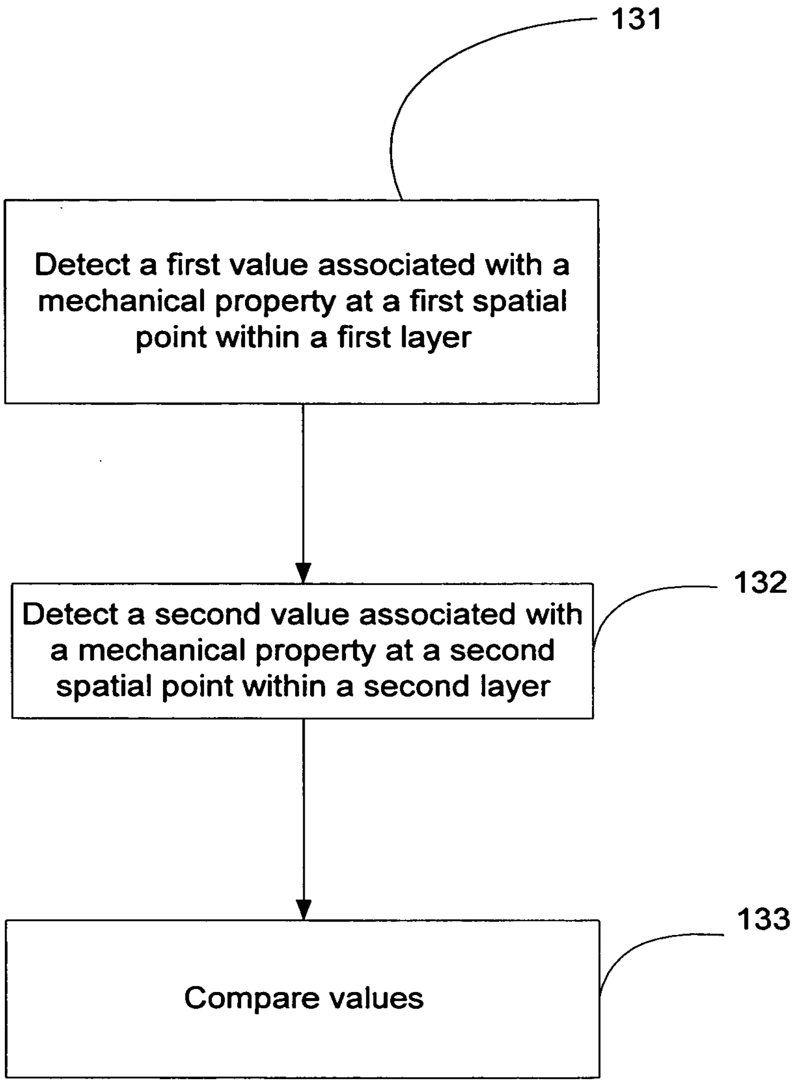
131
Detect a first value associated with a mechanical property at a first spatial point within a first layer
132
Detect a second value associated with a mechanical property at a second spatial point within a second layer
133
Compare values

FIG. 14

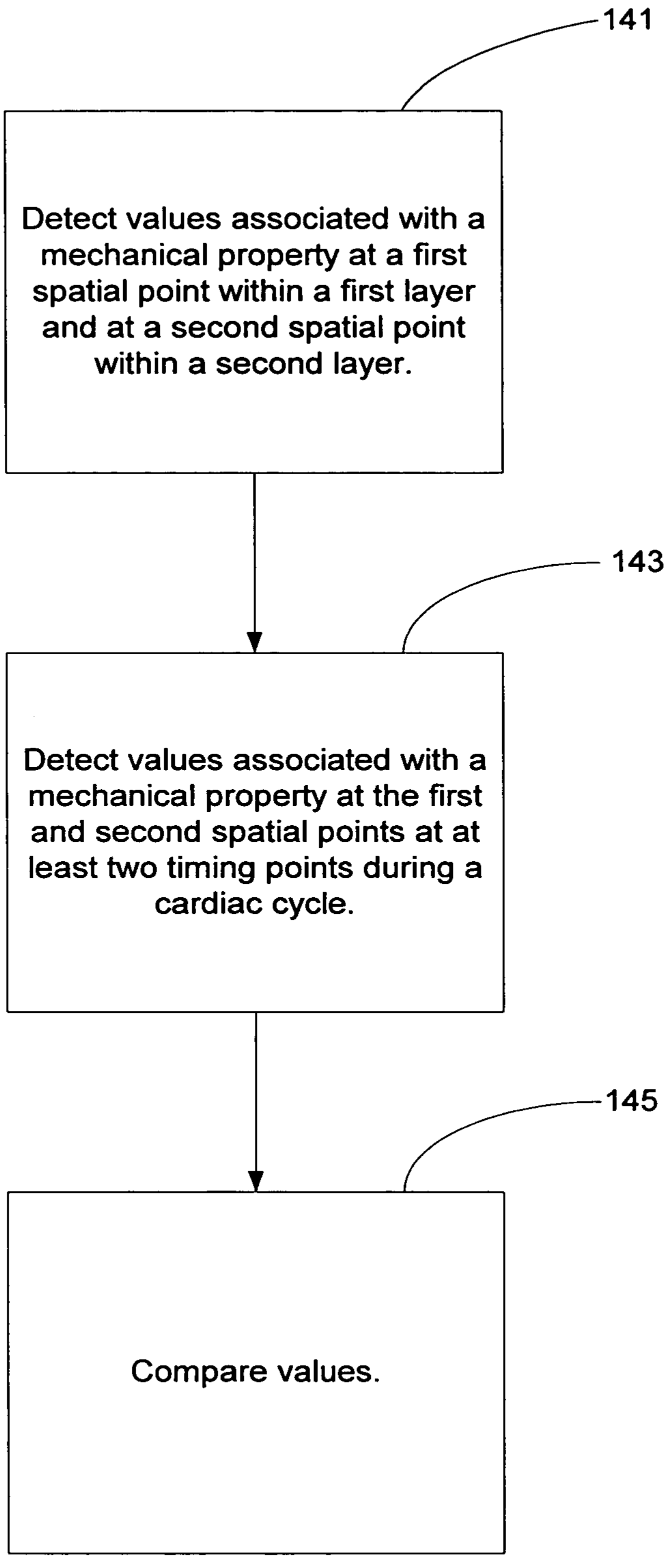
141
Detect values associated with a mechanical property at a first spatial point within a first layer and at a second spatial point within a second layer.
143
Detect values associated with a mechanical property at the first and second spatial points at at least two timing points during a cardiac cycle.
145
Compare values.

FIG 15

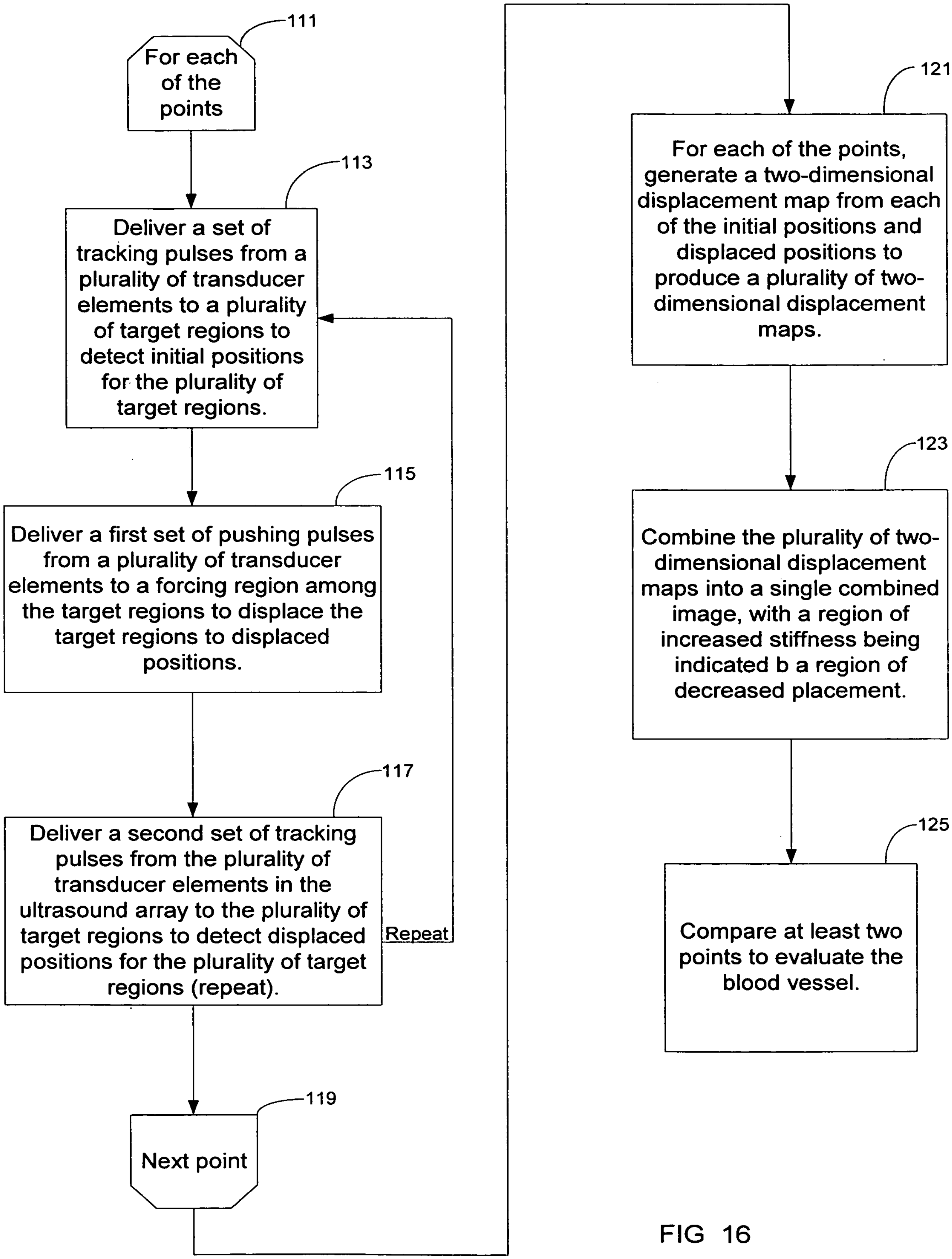
111
For each of the points
113
Deliver a set of tracking pulses from a plurality of transducer elements to a plurality of target regions to detect initial positions for the plurality of target regions.
115
Deliver a first set of pushing pulses from a plurality of transducer elements to a forcing region among the target regions to displace the target regions to displaced positions.
117
Deliver a second set of tracking pulses from the plurality of transducer elements in the ultrasound array to the plurality of target regions to detect displaced positions for the plurality of target regions (repeat).
Repeat
119
Next point
121
For each of the points, generate a two-dimensional displacement map from each of the initial positions and displaced positions to produce a plurality of two-dimensional displacement maps.
123
Combine the plurality of two-dimensional displacement maps into a single combined image, with a region of increased stiffness being indicated b a region of decreased placement.
125
Compare at least two points to evaluate the blood vessel.

FIG 16

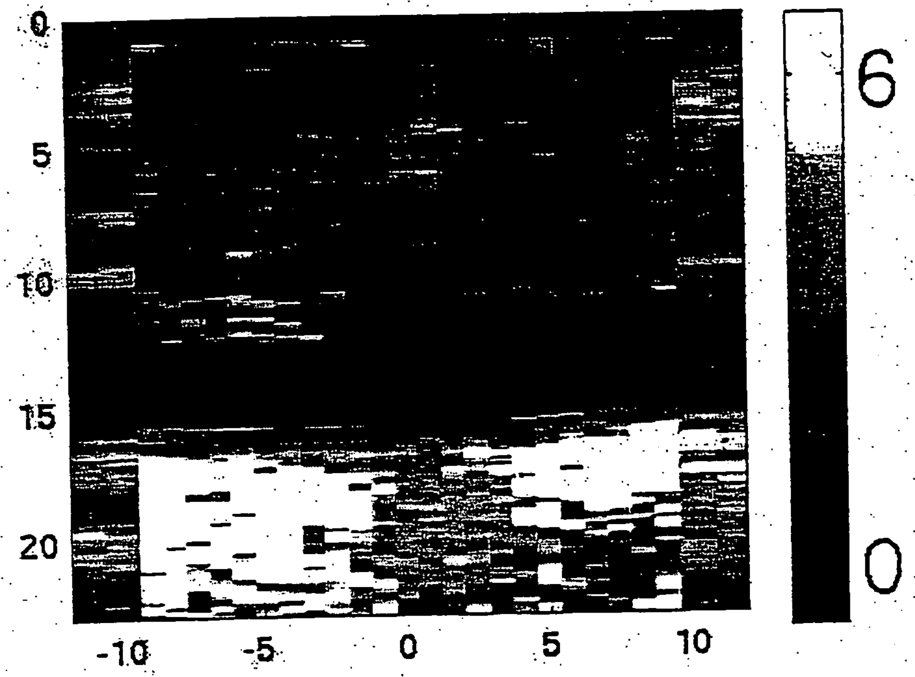

FIG. 17

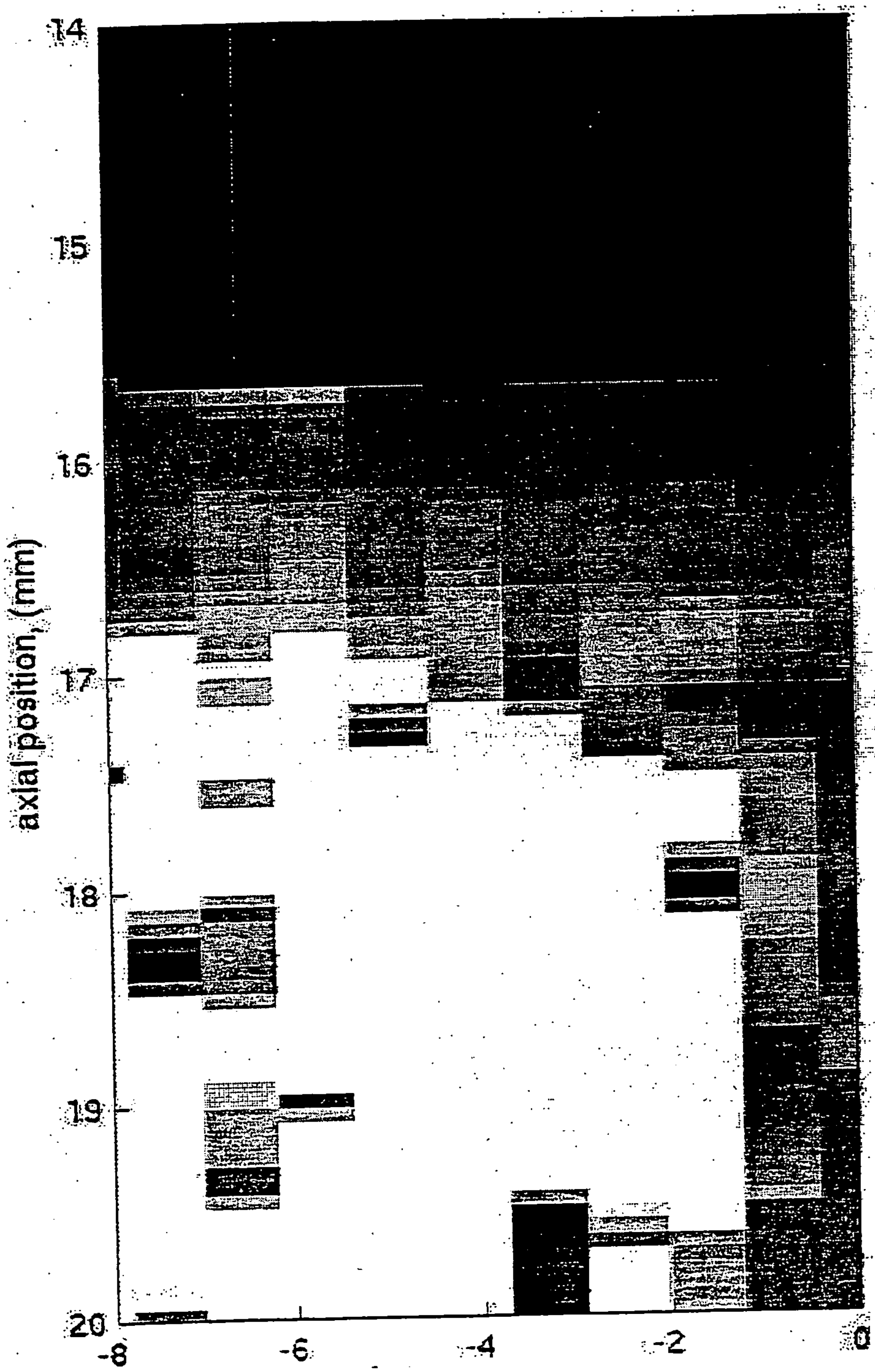

FIG. 18

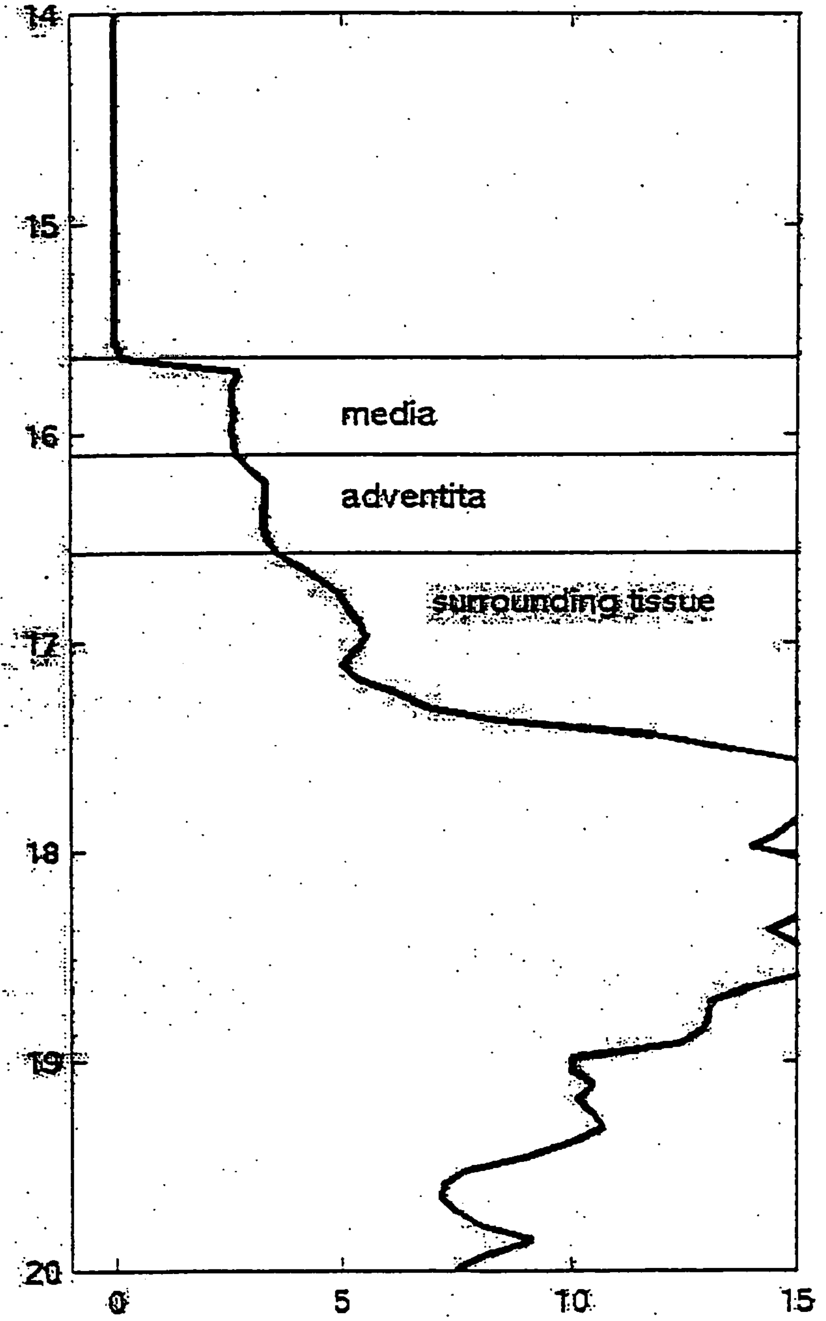
14
15
16
17
18
19
20
0
5
10
15
media
adventita
surrounding tissue

FIG. 19